

After the first impulse this extreme electro-negativeness of the selenium, due partly to polarisation, gave way and it gradually passed again to the electro-positive side, where, after a few minutes, it settled to a constant value, but still electro-negative to its condition in the dark.

I found that the slightest shadow or other variation in the intensity of the light caused a considerable variation in the electromotive force of the couple and a consequent indication.

On excluding the light the selenium instantly increased in electro-positiveness, and soon settled to its original position.

A couple in which two plates of selenium were opposed to each other, light being excluded from one and admitted to the other, gave identical results, only the resistance of the element was much greater.

The effect of light, therefore, in modifying the surface tension of selenium is evidently to render it more electro-negative and presumably not more metallic, as has been suggested in explanation of its increased conductivity.

I am endeavouring to construct a combination of selenium elements which, with a mirror galvanometer and photographic arrangement may be used to give a trustworthy record of the intensity of daylight. The practical difficulties in the way at present I have hopes will not be insurmountable.

ROBERT SABINE

NOTES

WE regret to notice the death, on the 18th inst., of Dr. Thomas Thomson, F.R.S., for some years Superintendent of the Botanic Gardens at Calcutta, and joint author of Hooker and Thomson's "Flora Indica." He was also a contributor to Sir J. D. Hooker's "Flora of British India," now in progress.

THE following are the names of those whom the Council of the Royal Society have recommended for election on June 6 next as appointed:—J. G. Baker, F. M. Balfour, Rev. T. G. Bonney, Prof. J. H. Cotterill, Sir W. Elliot, Canon W. Greenwell, T. Hawksley, C.E., J. Hopkinson, D.Sc., J. Hughlings Jackson, M.D., Lord Lindsay, P.R.A.S., S. Roberts, E. A. Schäfer, H. Sprengel, G. J. Symons, and C. S. Tomes.

THE scientific world has sustained a loss by the decease of the Rev. James Booth, LL.D., F.R.S., Vicar of Stone, near Aylesbury, which occurred on the 15th inst., at the age of seventy-one. He was educated at Trinity College, Dublin, where he obtained several prizes and graduated in honours. He was elected a Fellow of the Royal Society in 1846, to a very great extent in recognition of his earliest publication, "A New Method of Tangential Co-ordinates," and also as the inventor of a new system of parabolic trigonometry. In 1852 and 1853 he contributed to the *Philosophical Transactions* two memoirs on "The Geometrical Properties of Elliptic Integrals." He was also known as the contributor of several papers on mathematical subjects to the *Philosophical Magazine*, and not a few of these, we believe, have found their way into other languages. In 1859 he was presented to the living of Stone by the Royal Astronomical Society, to whom the advowson belongs.

DR. FREDERICK KAMPF, who has been the astronomer of Lieut. Wheeler's U.S. exploring expedition, died in Washington, on March 30, at the age of thirty-six. Dr. Kampf was educated at Bonn, and emigrated to the United States in 1870, securing a position in connection with the United States Coast Survey until 1873, when he joined the party of Lieut. Wheeler as already mentioned. He promised to attain to much distinction as an astronomer and observer, and his untimely death is much to be lamented.

THE collection of shells of the late Dr. P. P. Carpenter, of Montreal, is for sale. The opportunities of Dr. Carpenter for

making this collection of desirable specimens were very great, especially from the great Reigan collection of Mazatlan shells, which he purchased many years ago, and after investigation deposited duplicate series in several museums in Europe and America. The collection embraces about 4,000 species and varieties, for the most part original types. The collection is deposited for the present in the museum of McGill College, Montreal.

DR. RUD. FALB, of Vienna, who is engaged in studying the earthquake region in South and Central America, has left Chile and announces his arrival at Arequipa. He intends to ascend the volcano of Misti, near Arequipa, which is some 17,600 feet in height. He also reports that at the southern part of the Peruvian coast the shocks of earthquake continue with unabated violence, and that a violent eruption occurred recently from the Cotopaxi Volcano in the Andes of Quito, without, however, doing much damage.

AN Ethnographical Congress will assemble in Paris on June 24, and continue for three days. The head-quarters of the Commission are rue Monsieur, 19.

The Chair of Surgery at the Collège de France, occupied by the late Claude Bernard, has been offered to Prof. Charrot. It has been decided to erect the statue of the distinguished physiologist immediately before the Collège de France.

DR. E. BAUMANN, one of the most promising of the young physiological chemists of Germany, has received a Professorship in the Berlin University.

WE notice the death of Prof. H. Girard at Halle, on April 12. He was, until a recent date, director of the Mineralogical Museum of the University of Halle, and his name is associated with several mineralogical researches, more especially in connection with the Stassfurt deposits.

AMATEURS of spectrum analysis will thank Mr. Browning for a little pocket case he is now selling which permits a study of absorption phenomena in a very satisfactory manner. Various substances, which give very characteristic band absorption, have been mixed with gelatine so as to form a thin transparent coloured film. In that we have received, roseine, eosine, cochineal, indigo, aniline blue, Hofmann's violet, and other colouring matters have been treated in this way. There are twelve differently coloured films in all, and the variations in the spectra are very striking. On holding the films horizontally close to the slit so that one film falls on the upper and the next on the lower part of it, a capital idea of the use of comparison spectra can be gained.

M. DABRY DE THIERSANT, a French *Chargé d'Affaires*, who has been instrumental in introducing a number of Chinese plants and animals into his native country, is now making arrangements for importation in quantities of the *seta*, one of the most valued fish found in Chinese waters. The fish belongs to the carp family, and when fed on sea-plants in ponds, attains with great rapidity a weight of about forty pounds. During the past three years experiments made on the fish in the Jardin d'Acclimatation have shown it to be well adapted to a European climate, and as it increases rapidly, it is hoped that within a few years it can be introduced extensively throughout Europe.

A LITTLE village in the neighbourhood of Draguignan, France, has lately been the scene of a remarkable subsidence which has attracted the curious from all directions. An elliptical tract of ground, containing over 10,000 square feet, sank gradually one day, accompanied by loud noises, until it left an orifice of over 100 feet in depth, with water at the bottom. Numerous trees and vines disappeared completely in the depths of the new lake. A similar depression on a smaller scale occurred in the same vicinity a century ago, and both the phenomena are attributed to the action of subterranean streams.

THE Central Society of Agriculture of France took possession, on March 13, of a splendid hotel which has been built for its use and presented to it by M. Behague, one of its most active members. This society is one of the oldest in Europe, having been established more than a century ago, under the reign of Louis XV. It has never been suppressed or interrupted in spite of the several changes and revolutions the French Government has undergone during that eventful period.

THE International Congress of Medical Sciences, which was to be held at Amsterdam in September, 1878, has been postponed to 1879, in order to avoid a coincidence with the Paris International Exhibition.

M. BARDOUN, the French Minister of Public Instruction, having established an observatory for astronomical and meteorological purposes at Besançon, the general council of the Doubs department have voted a sum of 5,000 francs for meteorological observations to be conducted in the building.

THE private view of Winkler's Lunar Landscape, which we recently described, will be on Saturday and Monday next, at the new premises of the Belgian Gallery, 112, New Bond Street. The picture will be lighted by artificial light, this having been found to be most suitable to the nature of the subject.

KEW GARDENS were opened to the Public on Easter Monday at 10 A.M., and will be opened at the same hour on future bank holidays. Of the necessity of this step some idea may be formed from the following statement of the number of visitors on Monday:—From 10 to 1, 3,352; from 1 to 7, 42,833; total, 46,185.

MACMILLAN AND CO. are about to publish a little manual of "Practical Chemistry, for the Use of Medical Students," &c., by Mr. M. M. Pattison Muir, of Caius College, Cambridge.

A TERRIBLE hurricane is reported to have occurred at Tahiti, on February 7, in which 120 persons were killed, and much property destroyed.

HITHERTO we have had no occasion to say anything concerning the disturbances in the East, but during the past week there was a commotion at that now historical place St. Stefano, which we cannot let pass without reference. Happily the commotion was only seismic and did no damage. It occurred on Friday evening last and was strongly felt at Pera, while at Ismid and Broussa damage is said to have been done. The sea in the neighbourhood of the British fleet was so agitated that the commander of a gunboat sent a request to Admiral Hornby to give him previous notice on the next occasion of torpedo practice.

IN connection with our recent note on chemical dictionaries we notice the completion of the second volume of the German "Handwörterbuch der Chemie," ending with the article on Electricity from the pen of Prof. Wiedemann, of Leipzig.

AT a recent meeting of the French Academy, M. Gaiffe presented an apparatus with which one may determine immediately, and by a simple reading, the electromotive force of any electro-generator. It is based on Fechner's method of measuring such forces, and the measures are read in volts. M. Gaiffe employs a very resistant multiplier, and a small rheostat, by means of which introducing resistances, greater or less, into the circuit, the instrument may be adapted for very different measures of electromotive force, the same divided scale, however, being always employed. On introducing such and such a resistance you divide or multiply, in a proportion marked on the contacts of the rheostat, the electromotive force indicated by the galvanometric needle. Forces may thus be measured by the instrument from $\frac{1}{10}$ volt up to 150 volts.

J. E. PEIJSMANN has just published, in Batavia, an account of a scientific tour through the island of Amboina, one of the most important spice islands in Malaysia. In addition to a variety of valuable and novel observations, M. Peijsmann collected over 1,000 varieties of plants and 300 specimens of the fauna, which are to be transmitted to the museums of the University of Leyden.

A NEW bridge across the Rhine is now in course of construction at Basel; it will rest on five pillars.

THE Dutch Government intends to construct a canal from Amsterdam through the so-called Geldern Valley to the Upper Waal (the southern branch of the Rhine), and also additional canals in the provinces of Drenthe and Overijssel. Both projects are of great commercial importance with regard to navigation on the Rhine and the communication by water between Germany and Holland.

DR. SCHOMBURGK, the director of the Botanic Garden, Adelaide, South Australia, has issued a very brief report relative to the economical value of the various species of South Australian "Eucalyptus." He shows that out of the large number of species of Eucalyptus spread over Australia and Tasmania, only thirty appear in the extra-tropical part of South Australia. The South Australian species do not reach so great a height as those of the east, north, and south, and only about ten species yield timber that is much valued and used, though Dr. Schomburgk thinks many more might be utilised. The most valuable timber in the colony is stated to be the red gum (*Eucalyptus rostrata*, Schlecht). It is the most durable of all the South Australian woods, and is mostly used for underground work, bridges, jetties, railway-sleepers, and for shipbuilding; moreover, it has the reputation of being proof against the attacks of white ants. This tree grows to a height of from 100 feet to 130 feet. The next most important species is the white gum (*Eucalyptus stuartiana*, F. Muell.), the blue gum (*E. viminalis*, Las.), and the stringy bark (*E. obliqua*, L'Herit.). Dr. Schomburgk points out that the woods are not the only useful products of the Eucalypti. From *E. obliqua*, *E. leucoxylon*, and *E. rostrata*, acetic acid is obtained; wood-spirit is also procured from the first two, essential oils are produced from the leaves of *E. viminalis*, *E. stuartiana*, and *E. citriodora*; tar from woods of *E. rostrata*, *E. leucoxylon*, and *E. obliqua*; and from the barks of several other species paper has been made.

IT is announced by M. Toselli, that through successive improvements of his refrigerating apparatus, he can now produce one kilogramme of ice in the space of two minutes.

THE announcement of the intended publication, in a short time, by the Smithsonian Institution, of a complete catalogue of the plants of North America, will be hailed with great satisfaction by botanists. The region covered extends from Greenland and the Arctic Ocean, on the north, to the borders of Mexico, and from the Atlantic to the Pacific. The species are enumerated in their systematic sequence, with their synonyma. The work will be published in two parts, the first, on the polypetalæ, constituting a volume of about 480 pages. It covers the ground of volume i. of Torrey and Gray's "Flora of North America." The title of the work will be "Bibliographical Index of North American Botany," by Sereno Watson.

THE increase of volume of liquids through absorption of gases has lately been investigated by Messrs. Mackenzie and Nichols, in the Physical Laboratory of Berlin University. Experimenting in the first instance with carbonic acid and water only, and employing two different methods, they reach the same result, viz., that the expansion is directly proportional to the quantity of gas absorbed. They further examined the expansion of water saturated with carbonic acid by heat, and got a curve having

about the same course as that for pure water, except that the maximum of density was reached, not at 4°, as in the case of pure water, but under 3°, as is the case with salt substances.

RECENT observations by M. Ebermayer demonstrate (1) that the air in a large forest is in summer nearly twice as rich in carbonic acid as free open air; (2) that forest ground in summer contains much less CO₂ than unwooded ground (the CO₂ formed by slow decomposition of humus in the close forest seems mostly to pass into the air, and is probably utilised by the leaves for assimilation); (3) that, with rise of temperature, the increase of CO₂ in arable ground is very much greater than in forest ground; and (4) that the spread and motion of CO₂ in the ground seems to take place very slowly, for in two places quite near together the amount of CO₂ may be very different. Among other bearings of these facts, the ground covering of a forest can have no important influence on the amount of CO₂ and lime in spring water, and unwooded ground may have a greater action in this respect. Again, animals living underground, e.g. foxes, naturally prefer the ground air of the forest, with its little CO₂, to the ground air of the open field, which has much more.

THE influence of concentration of liquids on their electromotive force has lately been investigated by M. Moser (*Monatsb. der Berliner Acad. der Wiss.*) who connected two glasses of differently concentrated solutions of the same salt by a siphon, and completed the circuit by wires with electrodes, which were always of the same metal. In all such cases a current arises, passing in the liquid from the dilute to the more concentrated solution. M. Moser used zinc sulphate, nitrate, chloride, and acetate, copper sulphate and nitrate, iron chloride, silver acetate and nitrate, and other salts. The highest electromotive force was $\frac{1}{2}$ Daniell, and was got with very dilute and concentrated zinc chloride solution. The various effects are arranged in tension-series. By the currents referred to, metal is dissolved in the dilute solution, separated out in the concentrated one. The equivalent of the work done by the current, M. Moser considers, is the work of attraction force between the salt and the water. The current is to be regarded as a reaction current against passage of the ions, as the polarisation current is the reaction current against the decomposition current.

THE subject of acoustic repulsion continues to be studied by M. Dvorak (*Wied. Ann.*, No. 3). Among other things he constructs an acoustic reaction wheel and an acoustic torsion balance. The former consists of four light paper or glass resonators placed tangentially at the four ends of two thin cross-bars of wood, pivoted at their intersecting point by means of a glass cap. The mouths of the resonators are all in the same relative position. The wheel is placed before the open end of a tuning-fork resonator, and enters into rotation when the fork is sounded. In another case the sound from the large resonator is transmitted through a conical tube beyond whose thin end is a wheel with square pieces at the end of the cross-arms. In the acoustic torsion balance a wooden bar furnished with a resonator is hung by a wire (as in Coulomb's balance) within a case, which has on the resonator side an opening for admission of sound. By repulsion of the resonator the strength of tones of the same number of vibrations may be compared.

LECTURING at the Sorbonne lately on atmospheric electricity, M. Mascart sought to reproduce the phenomena of thunderstorms. The dull explosions of thunder and the fulgurations in the heart of clouds preceding fulminant discharges, as also the latter, were imitated by means of a powerful Holtz machine, charging batteries, and condensers suitably arranged. The singular movements of thunder-clouds, which, obeying electric attractions and repulsions, are often observed to move in the atmospheric ocean in counter-currents, were illustrated with the aid of a balloon of hydrogen gas, to which was suspended a

piece of metallic wire. The weight of the wire was such that the small aerostat, rendered slightly heavier than the displaced air, would descend; but when it was electrified, it rose again, as if freed from its burden. M. Mascart did not attempt an explanation of this curious phenomenon, which has not been repeated since the time of van Marum.

In a recently-published report by M. Kellner to the Naturforscher Versammlung at Munich, he describes experiments made along with some others on an eleven-year old Wallachian horse of 434 kilo. weight, with regard to the relation of work done and decomposition of albumen. In five successive periods of thirteen to fourteen days the animal was fed with 5 k. meadow-hay, 5 k. oats, and 1.5 k. chopped wheat straw, and did work to the extent of 500,000, 1,000,000, 1,500,000, 1,000,000, and 500,000 kilogrammetres in the five periods respectively. In periods I. and V. the work done was the same, in II. and IV. doubled, and in III. tripled; in II. and III. the course was doubled and tripled, and in IV. the weight doubled. Of the dry substance of the fodder were digested in period I. 56.53 per cent., II. 56.45 per cent., III. 56.49 per cent., IV. 54.01 per cent., V. 53.07 per cent. The horse's weight varied as follows:—I. 534.1, II. 529.1, III. 522.3, IV. 508.8, V. 518 kilo. The excretion of nitrogen was on an average of the last six to nine days of each experimental series, I. 98.81 k., II. 109.16, III. 119.82, IV. 107.53, V. 101.88. These numbers show strikingly, in opposition to Voit's and Pettenkofer's results, that with increase of work done, is associated a not inconsiderable increase of decomposition of albumen.

THE additions to the Zoological Society's Gardens during the past week include an Indian Leopard (*Felis pardus*) from India, presented by Major Tubbs; a Red Deer (*Cervus elaphus*), a Common Fox (*Canis vulpes*), European, presented by Mr. Carroll W. Ansell; two Spotted Ichneumons (*Herpestes auro-punctatus*) from Nepal, presented by Mr. J. McIntosh; a Suricate (*Suricata senik*) from South Africa, presented by Mr. Percy Howard; an Azara's Fox (*Canis azaræ*) from Brazil, presented by Dr. A. Stradling; a Stanley Crane (*Tetrapteryx paradisea*) from South Africa, presented by Capt. A. F. Lendy; a Lead-beater's Cockatoo (*Cacatua leadbeateri*) from Australia, presented by Mr. W. Ruston; a Collared Fruit Bat (*Cynonycteris collaris*), four Common Foxes (*Canis vulpes*), born in the Gardens.

THE DETERIORATION OF OIL PAINTINGS¹

IF we compare the pictures of the Italian and Dutch schools of the fifteenth, sixteenth, and seventeenth centuries, with those of the French and English schools of the last hundred years, we are struck by the great difference in the nature of their diseases. We may divide those diseases into constitutional ones—that is to say, such as are based on the method and the material used for painting, and into those produced by external influences.

The Dutch pictures of the fifteenth, sixteenth, and seventeenth centuries, and the Italian pictures of the fifteenth and sixteenth centuries, seem to me perfectly free from constitutional diseases. It is only in the seventeenth century that the Italian pictures show a special constitutional alteration, caused by the practice of the Bologna school.

The pictures of the last hundred years of the French school, of a part of the English school, and some painters of other schools, have been attacked by a constitutional disease perfectly defined and characteristic of this period.

Among external influences injurious to oil painting, we have to consider dampness, heat, bad air, dust, smoke, mechanical injuries, and last, not least, the destructive or "altering" hand of the picture-restorer.

Pettenkofer's scientific researches first clearly defined the influence of humidity on oil paintings, showing that it produced a discontinuity of the molecules of the vehicle and the resinous substances. As glass, when pulverised and thereby mixed with air, loses its transparency, and water, when mixed with oil,

¹ Paper read at the Royal Institution, Friday, March 1, by R. Liebreich, M.D., M.R.C.S., M.R.I. Continued from p. 475.